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MORBIDITY AND MORTALITY WEEKLY REPORT

Recommendations of the Immunization Practices Advisory Committee (ACIP)

Immunization of Children Infected With Human Immunodeficiency Virus – Supplementary ACIP Statement

The Immunization Practices Advisory Committee (ACIP) recently reviewed data both on the risks and benefits of immunizing children infected with human immunodeficiency virus (HIV) (*1*) and on severe and fatal measles in HIV-infected children in the United States (*2*). Since this review, the committee has revised its previous recommendations for measles vaccination and for mumps and rubella vaccination.

Previously published ACIP statements on immunizing HIV-infected children have recommended vaccinating children with asymptomatic HIV infection, but not those with symptomatic HIV infection (*3*). After considering reports of severe measles in symptomatic HIV-infected children, and in the absence of reports of serious or unusual adverse effects of measles, mumps, and rubella (MMR) vaccination in limited studies of symptomatic patients (*4,5*), the committee feels that administration of MMR vaccine should be considered for all HIV-infected children, regardless of symptoms. This approach is consistent with the World Health Organization's recommendation for measles vaccination (*6*).

If the decision to vaccinate is made, symptomatic HIV-infected children should receive MMR vaccine at 15 months, the age currently recommended for vaccination of children without HIV infection and for those with asymptomatic HIV infection. When there is an increased risk of exposure to measles, such as during an outbreak, these children should receive vaccine at younger ages. At such times, infants 6 to 11 months of age should receive monovalent measles vaccine and should be revaccinated with MMR at 12 months of age or older. Children 12-14 months of age should receive MMR and do not need revaccination (*7*).

The use of high-dose intravenous immune globulin (IGIV) (approximately 5 gm% protein) administered at regular intervals is being studied to determine whether it will prevent a variety of infections in HIV-infected children. It should be recognized that

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MMR vaccine may be ineffective if administered to a child who has received IGIV during the preceding 3 months.

Immune globulin (IG) (16.5 gm% protein) can be used to prevent or modify measles infection in HIV-infected children if administered within 6 days of exposure. IG is indicated for measles-susceptible* household contacts of children with asymptomatic HIV infection, particularly for those under 1 year of age and for measles-susceptible pregnant women. The recommended dose is 0.25 mL/kg intramuscularly (maximum dose, 15 mL) (*7*).

In contrast, exposed symptomatic HIV-infected patients should receive IG prophylaxis regardless of vaccination status. The standard postexposure measles prophylaxis regimen for such patients is 0.5 mL/kg of IG intramuscularly (maximum dose, 15 mL) (*7*). This regimen corresponds to a dose of protein of approximately 82.5 mg/kg (maximum dose, 2,475 mg). Intramuscular IG may not be necessary if a patient with HIV infection is receiving 100-400 mg/kg IGIV at regular intervals and received the last dose within 3 weeks of exposure to measles. Based on the amount of protein that can be administered, high-dose IGIV may be as effective as IG given intramuscularly. However, no data exist on the efficacy of IGIV administered postexposure in preventing measles.

Although postexposure administration of globulins to symptomatic HIV-infected patients is recommended regardless of measles vaccine status, vaccination prior to exposure is desirable. Measles exposures are often unrecognized, and postexposure prophylaxis is not always possible.

While recommendations for MMR vaccine have changed, those for other vaccines have not (*3*). A summary of the current ACIP recommendations for HIV-infected persons follows (Table 1). These recommendations apply to adolescents and adults with HIV infection as well as to HIV-infected children.

*Persons who are unvaccinated or do not have laboratory evidence or physician documentation of previous measles disease (*7*).

TABLE 1. Recommendations for routine immunization of HIV-infected children – United States, 1988*

Vaccine	HIV Infection	
	Known Asymptomatic	Symptomatic
DTP†	yes	yes
OPV§	no	no
IPV¶	yes	yes
MMR**	yes	yes††
HbCV§§	yes	yes
Pneumococcal	no	yes
Influenza	no	yes

*See accompanying text and previous ACIP statement (*3*) for details.
†DTP = Diphtheria and tetanus toxoids and pertussis vaccine.
§OPV = Oral, attenuated poliovirus vaccine; contains poliovirus types 1, 2, and 3.
¶IPV = Inactivated poliovirus vaccine; contains poliovirus types 1, 2, and 3.
**MMR = Live measles, mumps, and rubella viruses in a combined vaccine.
††Should be considered.
§§HbCV = *Haemophilus influenzae* type b conjugate vaccine.

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7. Immunization Practices Advisory Committee. Measles prevention. MMWR 1987;36: 409-18,423-5.

Epidemiologic Notes and Reports

Measles in HIV-Infected Children, United States

The Centers for Disease Control has received reports of six cases of measles that occurred among children infected with human immunodeficiency virus (HIV) in the United States during the period 1986-1987 (Table 1). Two of these children died from measles. Like many other infections, measles appears to be more severe in persons with HIV infection.

Patients 1-3 became ill during a nosocomial outbreak in a New York City hospital (*1*). These patients had acquired HIV infections perinatally. None had received measles vaccine nor were they receiving intravenous immune globulin

TABLE 1. Cases of measles in children infected with HIV — United States, 1986-1987

Case	Age	City	HIV Classification	Measles Vaccine	Acquired	Typical Rash	Complication	Outcome
1	7 mo	NYC	P-0*	no	hospital	yes	none	survived†
2	2 yr	NYC	P-2/D-2*	no	hospital	no§	pneumonia	survived¶
3	4 yr	NYC	P-2/D-1*	no	hospital	yes	pneumonia	died
4	2 yr	NYC	P-2/A*	no	hospital	yes	otitis media	survived
5	4 yr	Miami	P-2/C*	no	ER††	no	pneumonia	died
6	14 yr	NYC	IV/E**	yes	community	yes	pneumonia	survived

*For classification criteria, see *MMWR* 1987;36:225-35(*2*).
†Postexposure prophylaxis with immune globulin more than 6 days after exposure.
§Evanescent rash with Koplik spots.
¶Postexposure prophylaxis with varicella-zoster immune globulin more than 6 days after exposure.
**For classification criteria, see *MMWR* 1986;35:334-9 (*3*).
††Probable exposure in an emergency room.

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(IGIV). All were assumed to have had a common source of exposure to measles in the hospital, but the source was never identified. A medical student, who probably acquired disease from the same source, developed a rash several days before the children did. The medical student, whose rash illness was initially thought to be varicella because she recently had been exposed to a patient with varicella, had contact with the HIV-infected patients. Consequently, Patient 2 received varicella-zoster immune globulin (VZIG), and Patient 1 received intramuscular immune globulin (IG). Both patients developed measles within several days of globulin administration and thus may have received globulins more than 6 days after exposure. Patient 1, a 7-month-old with HIV class P-0 infection (indeterminant), and Patient 3, a 4-year-old with HIV class P-2, subclass D-1 infection (cryptosporidiosis) (*2*), had typical measles illnesses with cough, coryza, conjunctivitis, Koplik spots, and rash. Patient 1 had a measles hemagglutination-inhibition (HI) antibody titer of 10 on the first day of rash (due either to residual, passively transferred maternal antibody or to passive immunization). Patient 2, a 2-year-old with HIV class P-2, subclass D-2 infection (recurrent bacterial infections), had only a transient rash and Koplik spots. Both Patients 2 and 3 developed severe pneumonia and were treated with aerosolized ribavirin (*4*). Patient 3 died, and autopsy showed diffuse giant-cell pneumonia typical of measles infection consisting of multinucleate giant cells with nuclear and cytoplasmic inclusions (*5*).

Patient 4, a 2-year-old with perinatally acquired HIV infection, had HIV class P2, subclass A infection (hepatosplenomegaly, generalized lymphadenopathy, and herpes stomatitis) at the time of onset of measles. She acquired measles during hospitalization at a different hospital in New York City. The source of her infection was not determined. This patient had never been vaccinated against measles and was not receiving IGIV. She developed generalized rash, fever, coryza, conjunctivitis, Koplik spots, and otitis media but no other complications.

Patient 5, a 4-year-old child with perinatally acquired HIV class P-2, subclass C infection (lymphoid interstitial pneumonitis), was admitted with fever and pneumonia to a hospital in Miami, Florida. The patient had never been vaccinated against measles but was receiving IGIV (200 mg/kg) prophylactically every month. The last dose had been received 3 weeks before onset of illness. Her measles antibody titer at the time of onset of illness is not known. The patient developed respiratory failure and died 8 days after admission. There was no history of rash. The diagnosis of measles pneumonia was made on postmortem examination of lung tissue that showed multinucleate giant cells with nuclear and cytoplasmic inclusions. This patient was not isolated during her hospitalization, and nosocomial transmission of measles resulted: a pediatric nurse and a patient, neither of whom had been vaccinated, acquired measles from the child. One additional patient acquired infection from the nurse.

Patient 6, a 14-year-old with HIV Group IV infection (thrombocytopenia) (*3*), had acquired HIV as a result of a blood transfusion. He had been immunized with live, attenuated measles vaccine at 15 months and again at 9 years of age. The patient was admitted to a hospital with fever and later developed rash and pneumonia. Measles was serologically confirmed. The patient was treated with aerosolized ribavirin and recovered without sequelae.

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Editorial Note: In addition to these six measles cases in children with HIV infection, CDC has received reports of two measles cases in HIV-infected adults. Both survived the acute measles infection, although one was hospitalized. The two measles deaths involving HIV-infected children in 1987 were the first deaths due to measles in the United States to be reported to CDC since 1985. While there may be underreporting of nonhospitalized or nonfatal measles cases in persons with HIV infection, the case-fatality rate for measles in HIV-infected children is clearly higher than the case-fatality rate for measles in recent years in the United States, 0.1% (*6*).

Severe measles infections have been reported in other immunocompromised patients. Measles infection without rash has also been described (*7*). Physicians caring for patients with HIV infection should be aware that measles can be severe and may occur without the typical rash. This may preclude diagnosis and, thus, delay or prevent initiation of treatment, outbreak control measures, or appropriate hospital isolation. The fact that an unimmunized medical worker acquired measles from one of these cases and was involved in transmission to a hospitalized patient is noteworthy. In addition, five of the six measles cases in HIV-infected children were acquired in medical settings. Since hospital workers may acquire and/or transmit measles, hospitals should ensure that employees who may have occupational exposure to measles have proof of measles immunity (*8*).

During 1986 and 1987, large measles outbreaks occurred in urban areas of the United States among preschool-age children with low immunization levels (*9*). These areas (New York City, Jersey City, and Miami) also have high incidence rates of pediatric acquired immunodeficiency syndrome. Since HIV-infected children may live in areas where measles virus circulates because of low preschool measles immunization levels, they may be at higher risk of exposure to measles than other children in the United States.

As a result of these recent reports of measles in HIV-infected children, the Immunization Practices Advisory Committee (ACIP) now recommends that measles vaccine be considered for symptomatic as well as asymptomatic children with HIV infection (*10*). This approach to protect the HIV-infected child is consistent with the World Health Organization's recommendation to provide measles vaccination for all children in developing countries regardless of HIV and symptom status because of the high risk of measles and the severity of measles infection in general (*11*).

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TABLE I. Summary — cases of specified notifiable diseases, United States

Disease	12th Week Ending			Cumulative, 12th Week Ending		
	March 26, 1988	March 28, 1987	Median 1983-1987	March 26, 1988	March 28, 1987	Median 1983-1987
Acquired Immunodeficiency Syndrome (AIDS)	379	347	112	6,741	4,476	1,221
Aseptic meningitis	74	87	72	876	1,049	981
Encephalitis: Primary (arthropod-borne & unspec)	9	22	22	143	187	200
Post-infectious	3	-	4	19	13	21
Gonorrhea: Civilian	12,642	13,297	15,507	158,791	190,175	189,070
Military	229	254	322	2,893	3,977	4,564
Hepatitis: Type A	602	485	456	5,541	5,702	5,252
Type B	430	529	526	4,406	5,657	5,515
Non A, Non B	70	59	75	535	677	745
Unspecified	55	82	98	496	782	1,154
Legionellosis	11	16	13	145	166	133
Leprosy	4	3	3	33	48	58
Malaria	10	10	14	148	154	153
Measles: Total*	31	166	144	463	685	559
Indigenous	31	163	138	435	594	489
Imported	-	3	4	28	91	70
Meningococcal infections	73	85	85	834	976	798
Mumps	101	334	82	988	4,194	952
Pertussis	86	41	41	513	436	425
Rubella (German measles)	5	7	10	36	66	115
Syphilis (Primary & Secondary): Civilian	774	808	561	8,441	7,991	6,535
Military	3	5	4	51	52	54
Toxic Shock syndrome	4	7	7	61	70	92
Tuberculosis	419	425	425	3,910	4,363	4,363
Tularemia	2	-	1	21	17	17
Typhoid Fever	4	10	6	77	58	58
Typhus fever, tick-borne (RMSF)	2	1	1	17	9	11
Rabies, animal	99	131	109	723	976	980

TABLE II. Notifiable diseases of low frequency, United States

	Cum. 1988		Cum. 1988
Anthrax	-	Leptospirosis	7
Botulism: Foodborne	4	Plague	-
Infant	8	Poliomyelitis, Paralytic	-
Other	2	Psittacosis	18
Brucellosis (Tex. 1)	12	Rabies, human	-
Cholera	-	Tetanus (Calif. 1)	7
Congenital rubella syndrome	-	Trichinosis	4
Congenital syphilis, ages < 1 year	-		
Diphtheria	-		

*There were no cases of internationally imported measles reported for this week.

TABLE III. Cases of specified notifiable diseases, United States, weeks ending March 26, 1988 and March 28, 1987 (12th Week)

Reporting Area	AIDS	Aseptic Meningitis	Encephalitis		Gonorrhea (Civilian)		Hepatitis (Viral), by type				Legionellosis	Leprosy
			Primary	Post-infectious			A	B	NA,NB	Unspecified		
	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	6,741	876	143	19	158,791	190,175	5,541	4,406	535	496	145	33
NEW ENGLAND	287	41	7	4	4,736	6,917	210	316	58	34	5	4
Maine	11	3	1	4	102	223	11	14	1	1	1	-
N.H.	6	8	-	-	73	99	15	8	3	2	-	-
Vt.	3	2	2	-	41	53	3	10	4	-	-	-
Mass.	162	17	3	-	1,696	2,584	125	198	42	26	4	4
R.I.	13	9	-	-	416	532	30	37	6	-	-	-
Conn.	92	2	1	-	2,408	3,426	26	49	2	5	-	-
MID. ATLANTIC	2,250	111	18	-	23,701	30,986	295	487	33	41	32	3
Upstate N.Y.	364	57	13	-	2,565	3,877	183	126	16	2	20	-
N.Y. City	1,125	17	4	-	10,250	17,241	44	217	3	30	2	3
N.J.	568	37	1	-	3,498	3,672	68	144	14	9	-	-
Pa.	193	-	-	-	7,388	6,196	-	-	-	-	10	-
E.N. CENTRAL	504	117	20	1	24,856	26,515	278	459	27	32	43	-
Ohio	111	46	11	1	5,736	5,414	81	144	9	3	13	-
Ind.	39	19	2	-	2,177	2,083	32	49	1	12	5	-
Ill.	220	2	-	-	7,150	8,114	25	29	-	1	-	-
Mich.	113	45	4	-	8,206	8,538	119	206	14	16	20	-
Wis.	21	5	3	-	1,587	2,366	21	31	3	-	5	-
W.N. CENTRAL	153	47	12	2	6,182	7,688	382	241	21	8	12	-
Minn.	28	12	2	-	843	1,210	12	30	1	3	-	-
Iowa	8	10	6	-	385	755	18	22	4	-	4	-
Mo.	72	8	-	-	3,535	3,847	203	139	11	3	1	-
N. Dak.	-	-	-	-	33	91	2	2	1	-	-	-
S. Dak.	3	5	-	1	137	153	-	1	1	-	4	-
Nebr.	13	1	1	1	376	483	9	16	-	-	2	-
Kans.	29	11	3	-	873	1,149	138	31	3	2	1	-
S. ATLANTIC	1,019	200	20	5	44,717	49,357	379	911	72	81	26	-
Del.	14	5	1	-	636	711	2	22	2	1	2	-
Md.	113	17	1	1	4,448	4,911	46	154	4	2	5	-
D.C.	107	5	-	-	2,864	3,090	4	7	2	1	-	-
Va.	105	23	12	1	3,174	3,998	84	57	22	55	2	-
W. Va.	5	5	1	-	351	401	2	14	1	3	-	-
N.C.	75	38	4	-	7,498	7,405	54	152	18	-	10	-
S.C.	42	3	-	-	3,366	4,515	14	156	3	3	4	-
Ga.	142	27	1	-	8,379	8,482	63	148	2	1	2	-
Fla.	416	77	-	3	14,001	15,844	110	201	18	15	1	-
E.S. CENTRAL	169	63	12	2	12,105	13,712	275	256	47	5	6	1
Ky.	24	26	4	1	1,012	1,442	251	58	21	2	3	-
Tenn.	72	5	3	-	3,825	4,751	15	106	12	-	1	-
Ala.	52	25	5	1	4,339	4,470	3	83	13	3	2	1
Miss.	21	7	-	-	2,929	3,049	6	9	1	-	-	-
W.S. CENTRAL	607	59	5	-	18,661	20,492	548	276	36	102	3	-
Ark.	25	3	2	-	1,604	2,078	63	16	1	3	-	-
La.	96	11	-	-	4,342	4,192	22	59	4	3	1	-
Okla.	33	6	1	-	1,593	2,299	161	47	8	9	2	-
Tex.	453	39	2	-	11,140	11,923	302	154	23	87	-	-
MOUNTAIN	274	36	12	2	3,302	5,093	803	360	51	54	8	-
Mont.	5	1	-	-	93	127	16	15	3	2	-	-
Idaho	3	-	-	-	82	176	34	21	1	1	-	-
Wyo.	1	1	-	-	50	97	1	1	3	-	1	-
Colo.	93	11	2	-	813	1,025	34	46	4	22	4	-
N. Mex.	12	1	-	1	333	541	153	43	3	1	-	-
Ariz.	107	12	5	-	1,149	1,863	425	166	18	18	1	-
Utah	19	6	3	1	153	200	101	25	16	9	2	-
Nev.	34	4	2	-	629	1,064	39	43	3	1	-	-
PACIFIC	1,478	202	37	3	20,531	29,415	2,371	1,100	190	139	10	25
Wash.	72	-	1	2	1,541	2,052	414	104	25	14	5	-
Oreg.	57	-	-	-	723	1,017	474	171	23	4	-	-
Calif.	1,313	176	35	1	17,791	25,578	1,403	800	139	119	3	25
Alaska	7	6	-	-	272	505	80	17	2	2	-	-
Hawaii	29	20	1	-	204	263	-	8	1	-	2	-
Guam	-	-	-	-	32	53	1	3	-	2	-	3
P.R.	287	7	1	-	367	542	3	58	11	9	-	-
V.I.	2	-	-	-	93	55	-	3	-	-	-	-
Amer. Samoa	-	-	-	-	-	136	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	9	25	-	1	-	-	-	-

N: Not notifiable U: Unavailable C.N.M.I.: Commonwealth of the Northern Mariana Islands

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending March 26, 1988 and March 28, 1987 (12th Week)

Reporting Area	Malaria	Measles (Rubeola)					Menin-gococcal Infections	Mumps		Pertussis			Rubella		
		Indigenous		Imported*		Total									
	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	Cum. 1988	1988	Cum. 1988	1988	Cum. 1988	Cum. 1987	1988	Cum. 1988	Cum. 1987
UNITED STATES	148	31	435	-	28	685	834	101	988	86	513	436	5	36	66
NEW ENGLAND	16	-	1	-	-	8	72	1	4	21	71	11	-	-	-
Maine	2	-	-	-	-	-	2	-	-	-	11	-	-	-	-
N.H.	-	-	-	-	-	-	8	-	2	5	21	1	-	-	-
Vt.	-	-	-	-	-	6	2	-	-	-	-	3	-	-	-
Mass.	10	-	1	-	-	2	30	1	2	16	32	3	-	-	-
R.I.	2	-	-	-	-	-	13	-	-	-	-	-	-	-	-
Conn.	2	-	-	-	-	-	17	-	-	-	7	4	-	-	-
MID. ATLANTIC	22	14	119	-	1	103	67	10	65	1	14	55	2	4	3
Upstate N.Y.	11	-	-	-	1	16	33	6	21	-	6	39	1	1	1
N.Y. City	7	3	13	-	-	64	8	-	10	1	1	-	1	1	1
N.J.	4	-	-	-	-	5	26	3	17	-	1	4	-	1	1
Pa.	-	11	106	-	-	18	-	1	17	-	6	12	-	1	-
E.N. CENTRAL	8	-	12	-	3	66	84	10	223	8	47	60	-	4	12
Ohio	1	-	-	-	3	4	33	-	36	-	8	19	-	-	-
Ind.	-	-	-	-	-	-	7	2	21	7	24	-	-	-	-
Ill.	-	-	1	-	-	38	2	-	16	-	-	3	-	-	11
Mich.	6	-	11	-	-	23	31	8	99	1	10	16	-	4	1
Wis.	1	-	-	-	-	1	11	-	51	-	5	22	-	-	-
W.N. CENTRAL	4	-	-	-	-	4	37	5	60	1	30	25	-	-	-
Minn.	1	-	-	-	-	-	9	-	-	-	3	3	-	-	-
Iowa	-	-	-	-	-	-	-	2	23	1	14	3	-	-	-
Mo.	2	-	-	-	-	4	14	1	13	-	3	10	-	-	-
N. Dak.	-	-	-	-	-	-	-	-	-	-	6	1	-	-	-
S. Dak.	-	-	-	-	-	-	1	-	-	-	2	1	-	-	-
Nebr.	-	-	-	-	-	-	5	1	4	-	-	-	-	-	-
Kans.	1	-	-	-	-	-	8	1	20	-	2	7	-	-	-
S. ATLANTIC	17	14	100	-	5	16	150	17	67	1	42	101	-	-	6
Del.	-	-	-	-	-	-	-	-	-	-	3	-	-	-	-
Md.	2	-	-	-	2	-	19	4	6	-	9	-	-	-	1
D.C.	4	-	-	-	-	-	4	11	30	-	-	-	-	-	-
Va.	4	-	34	-	1	-	19	-	4	-	2	29	-	-	-
W. Va.	-	-	2	-	-	-	-	-	2	-	-	14	-	-	-
N.C.	1	-	-	-	1	-	25	1	10	-	19	45	-	-	-
S.C.	3	-	-	-	-	-	16	-	3	-	-	-	-	-	-
Ga.	1	-	-	-	-	-	20	1	5	1	8	10	-	-	-
Fla.	2	14	64	-	1	16	47	-	7	-	1	3	-	-	5
E.S. CENTRAL	2	-	-	-	-	-	75	4	175	-	7	6	-	-	2
Ky.	-	-	-	-	-	-	12	2	37	-	-	1	-	-	2
Tenn.	-	-	-	-	-	-	45	2	134	-	6	-	-	-	-
Ala.	2	-	-	-	-	-	15	-	3	-	-	3	-	-	-
Miss.	-	-	-	-	-	-	3	N	N	-	1	2	-	-	-
W.S. CENTRAL	14	-	8	-	-	6	48	26	172	4	29	34	-	1	-
Ark.	-	-	-	-	-	-	7	1	2	2	5	2	-	1	-
La.	1	-	-	-	-	-	10	4	68	-	2	5	-	-	-
Okla.	4	-	8	-	-	1	6	16	51	2	22	27	-	-	-
Tex.	9	-	-	-	-	5	25	5	51	-	-	-	-	-	-
MOUNTAIN	7	-	113	-	-	160	31	9	69	39	184	42	-	2	3
Mont.	-	-	-	-	-	1	-	-	-	-	1	1	-	-	-
Idaho	-	-	-	-	-	-	2	1	1	26	157	17	-	-	-
Wyo.	-	-	-	-	-	-	-	-	2	-	1	2	-	-	1
Colo.	3	-	113	-	-	-	8	1	16	-	3	12	-	1	-
N. Mex.	1	-	-	-	-	158	8	N	N	1	1	1	-	-	-
Ariz.	1	-	-	-	-	1	6	7	43	11	12	8	-	-	-
Utah	1	-	-	-	-	-	6	-	1	1	8	1	-	-	2
Nev.	1	-	-	-	-	-	1	-	6	-	1	-	-	1	-
PACIFIC	58	3	82	-	19	322	270	19	153	11	89	102	3	25	40
Wash.	3	-	-	-	-	-	22	-	6	-	13	17	-	-	-
Oreg.	4	-	-	-	-	27	13	N	N	-	2	12	-	-	1
Calif.	50	3	82	-	18	293	223	19	144	11	53	48	3	23	37
Alaska	1	-	-	-	-	-	3	-	3	-	2	3	-	-	-
Hawaii	-	-	-	-	1	2	9	-	-	-	19	22	-	2	2
Guam	-	-	-	-	1	1	-	-	2	-	-	-	-	1	-
P.R.	1	24	47	-	-	137	4	-	2	-	2	8	-	-	1
V.I.	-	-	-	-	-	-	-	-	9	-	-	-	-	-	-
Amer. Samoa	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
C.N.M.I.	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

*For measles only, imported cases includes both out-of-state and international importations.

N: Not notifiable U: Unavailable †International §Out-of-state

TABLE III. (Cont'd.) Cases of specified notifiable diseases, United States, weeks ending March 26, 1988 and March 28, 1987 (12th Week)

Reporting Area	Syphilis (Civilian) (Primary & Secondary)		Toxic-shock Syndrome	Tuberculosis		Tula-remia	Typhoid Fever	Typhus Fever (Tick-borne) (RMSF)	Rabies, Animal
	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1987	Cum. 1988	Cum. 1988	Cum. 1988	Cum. 1988
UNITED STATES	8,441	7,991	61	3,910	4,363	21	77	17	723
NEW ENGLAND	252	110	5	64	104	-	6	-	3
Maine	3	1	1	2	10	-	-	-	1
N.H.	2	1	2	-	5	-	-	-	2
Vt.	-	1	-	-	3	-	-	-	-
Mass.	99	59	2	38	30	-	4	-	-
R.I.	9	2	-	7	14	-	-	-	-
Conn.	139	46	-	17	42	-	2	-	-
MID. ATLANTIC	1,617	1,301	11	742	827	-	13	1	82
Upstate N.Y.	107	43	5	133	142	-	1	-	1
N.Y. City	1,064	913	2	316	395	-	6	1	-
N.J.	183	148	2	137	139	-	6	-	-
Pa.	263	197	2	156	151	-	-	-	81
E.N. CENTRAL	246	240	8	507	497	1	9	1	13
Ohio	25	16	5	92	104	-	2	-	-
Ind.	17	15	-	51	42	-	2	-	1
Ill.	126	149	-	192	204	-	4	-	4
Mich.	72	41	3	140	132	1	1	1	2
Wis.	6	19	-	32	15	-	-	-	6
W.N. CENTRAL	50	36	10	117	124	10	2	1	94
Minn.	4	4	-	21	31	-	1	-	41
Iowa	3	6	2	10	8	-	-	-	13
Mo.	30	19	4	54	64	8	1	1	5
N. Dak.	1	-	-	1	1	-	-	-	13
S. Dak.	1	3	-	12	5	-	-	-	16
Nebr.	5	3	2	4	7	1	-	-	1
Kans.	6	1	2	15	8	1	-	-	5
S. ATLANTIC	2,959	2,703	8	877	872	3	13	10	258
Del.	42	21	-	9	11	1	-	-	10
Md.	154	151	1	66	79	-	-	-	67
D.C.	138	79	-	42	29	-	-	-	1
Va.	105	61	-	105	82	1	5	-	88
W. Va.	1	4	-	21	29	-	-	-	15
N.C.	192	154	5	52	84	-	1	10	-
S.C.	129	155	-	89	95	-	-	-	14
Ga.	470	402	-	137	111	1	2	-	48
Fla.	1,728	1,676	2	356	352	-	5	-	15
E.S. CENTRAL	491	492	7	287	402	4	-	2	51
Ky.	14	3	2	99	96	3	-	-	33
Tenn.	198	243	3	48	123	-	-	1	-
Ala.	145	132	2	100	130	-	-	1	18
Miss.	134	114	-	40	53	1	-	-	-
W.S. CENTRAL	942	1,045	4	453	446	1	2	1	91
Ark.	47	53	-	41	37	-	-	-	19
La.	181	172	-	74	80	-	2	-	-
Okla.	39	41	2	45	56	1	-	1	5
Tex.	675	779	2	293	273	-	-	-	67
MOUNTAIN	150	174	4	87	129	2	3	1	52
Mont.	2	7	-	-	8	-	1	-	39
Idaho	-	1	1	1	13	-	-	1	-
Wyo.	-	-	-	-	-	-	-	-	5
Colo.	25	25	1	5	16	2	2	-	-
N. Mex.	17	15	-	22	24	-	-	-	3
Ariz.	43	84	1	46	59	-	-	-	5
Utah	7	4	1	-	1	-	-	-	-
Nev.	56	38	-	13	8	-	-	-	-
PACIFIC	1,734	1,890	4	776	962	-	29	-	79
Wash.	29	31	-	46	47	-	2	-	-
Oreg.	65	49	-	29	22	-	4	-	-
Calif.	1,631	1,806	4	656	827	-	21	-	77
Alaska	2	2	-	9	16	-	-	-	2
Hawaii	7	2	-	36	50	-	2	-	-
Guam	-	1	-	7	2	-	-	-	-
P.R.	147	233	-	38	56	-	2	-	16
V.I.	1	2	-	3	1	-	-	-	-
Amer. Samoa	-	53	-	-	40	-	-	-	-
C.N.M.I.	-	2	-	-	-	-	-	-	-

U: Unavailable

TABLE IV. Deaths in 121 U.S. cities,* week ending March 26, 1988 (12th Week)

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
NEW ENGLAND	765	543	142	46	16	18	69
Boston, Mass.	246	155	57	18	6	10	32
Bridgeport, Conn.	42	32	7	2	1	-	3
Cambridge, Mass.	33	29	3	1	-	-	3
Fall River, Mass.	28	23	4	1	-	-	2
Hartford, Conn.	67	45	12	5	3	2	1
Lowell, Mass.	16	14	2	-	-	-	1
Lynn, Mass.	17	12	3	1	1	-	2
New Bedford, Mass.	27	19	4	3	1	-	1
New Haven, Conn.	70	44	14	5	3	4	7
Providence, R.I.	57	46	7	3	1	-	2
Somerville, Mass.	8	4	4	-	-	-	1
Springfield, Mass.	46	38	6	1	-	1	3
Waterbury, Conn.	40	30	9	1	-	-	6
Worcester, Mass.	68	52	10	5	-	1	5
MID. ATLANTIC	3,193	2,072	697	275	74	72	193
Albany, N.Y.	70	48	14	3	1	4	3
Allentown, Pa.	16	14	2	-	-	-	-
Buffalo, N.Y.	115	81	25	5	1	-	16
Camden, N.J.	40	24	12	2	-	2	1
Elizabeth, N.J.	23	16	5	1	1	-	4
Erie, Pa.†	49	40	8	-	1	-	2
Jersey City, N.J.	68	41	15	11	-	1	1
N.Y. City, N.Y.	1,689	1,074	364	175	43	33	75
Newark, N.J.	98	47	23	18	7	3	4
Paterson, N.J.	35	17	12	5	-	1	3
Philadelphia, Pa.	422	264	104	34	9	11	28
Pittsburgh, Pa.†	74	50	18	4	-	2	5
Reading, Pa.	38	30	7	1	-	-	8
Rochester, N.Y.	139	97	29	7	2	4	21
Schenectady, N.Y.	32	27	3	-	2	-	1
Scranton, Pa.†	36	27	8	-	-	1	3
Syracuse, N.Y.	143	89	33	6	7	8	10
Trenton, N.J.	41	31	7	2	-	1	1
Utica, N.Y.	30	24	5	1	-	-	2
Yonkers, N.Y.	35	31	3	-	-	1	5
E.N. CENTRAL	2,445	1,633	500	172	55	82	118
Akron, Ohio	82	51	20	4	3	4	2
Canton, Ohio	54	42	8	3	-	1	5
Chicago, Ill.§	564	362	125	45	10	22	16
Cincinnati, Ohio	87	65	12	4	2	4	14
Cleveland, Ohio	188	113	56	16	1	2	1
Columbus, Ohio	166	96	43	10	9	5	2
Dayton, Ohio	105	79	13	5	5	3	7
Detroit, Mich.	265	168	48	26	5	18	7
Evansville, Ind.	60	48	8	3	1	-	8
Fort Wayne, Ind.	43	32	8	-	3	-	6
Gary, Ind.	21	13	5	1	-	2	1
Grand Rapids, Mich.	62	49	8	3	1	1	5
Indianapolis, Ind.	188	107	53	20	3	5	2
Madison, Wis.	36	24	7	4	-	1	2
Milwaukee, Wis.	151	115	22	5	2	7	8
Peoria, Ill.	66	42	14	4	3	3	7
Rockford, Ill.	59	43	9	5	2	-	5
South Bend, Ind.	52	42	7	3	-	-	8
Toledo, Ohio	121	89	20	9	1	2	11
Youngstown, Ohio	75	53	14	2	4	2	1
W.N. CENTRAL	1,003	720	173	65	16	29	87
Des Moines, Iowa	79	51	20	7	-	1	9
Duluth, Minn.	26	22	3	-	-	1	-
Kansas City, Kans.	37	29	2	3	1	2	2
Kansas City, Mo.	117	70	30	10	3	4	9
Lincoln, Nebr.	41	27	11	2	1	-	4
Minneapolis, Minn.	335	245	41	28	4	17	33
Omaha, Nebr.	103	67	27	6	2	1	11
St. Louis, Mo.	118	82	27	8	-	1	9
St. Paul, Minn.	69	60	4	1	3	1	1
Wichita, Kans.	78	67	8	-	2	1	9

Reporting Area	All Causes, By Age (Years)						P&I**
	All Ages	≥65	45-64	25-44	1-24	<1	Total
S. ATLANTIC	1,405	909	296	107	47	44	76
Atlanta, Ga.	195	114	47	20	6	8	3
Baltimore, Md.	193	121	43	17	9	3	10
Charlotte, N.C.	102	73	16	7	1	5	15
Jacksonville, Fla.	153	100	33	5	13	2	7
Miami, Fla.	87	46	21	14	4	1	-
Norfolk, Va.	75	46	18	4	2	5	8
Richmond, Va.	114	78	25	6	3	2	8
Savannah, Ga.	92	65	20	6	1	-	9
St. Petersburg, Fla.	89	74	6	1	2	6	3
Tampa, Fla.	71	41	16	7	1	5	5
Washington, D.C.	202	126	47	18	4	7	8
Wilmington, Del.	32	25	4	2	1	-	-
E.S. CENTRAL	871	593	184	52	22	20	72
Birmingham, Ala.	123	74	26	11	4	8	1
Chattanooga, Tenn.	75	48	18	7	1	1	10
Knoxville, Tenn.	111	76	22	8	3	2	16
Louisville, Ky.	100	67	26	5	1	1	3
Memphis, Tenn.	200	142	33	13	6	6	27
Mobile, Ala.	67	50	14	2	1	-	10
Montgomery, Ala.	46	35	9	1	-	1	3
Nashville, Tenn.	149	101	36	5	6	1	2
W.S. CENTRAL	1,383	865	291	140	44	43	56
Austin, Tex.	67	48	9	7	2	1	3
Baton Rouge, La.	64	44	14	4	1	1	2
Corpus Christi, Tex.	47	35	3	5	1	3	-
Dallas, Tex.	198	101	52	31	4	10	4
El Paso, Tex.	69	47	18	2	1	1	7
Fort Worth, Tex	107	77	15	7	5	3	5
Houston, Tex.§	308	176	74	34	13	11	7
Little Rock, Ark.	68	47	14	4	3	-	6
New Orleans, La.	150	85	35	20	4	6	-
San Antonio, Tex.	183	125	29	18	7	4	12
Shreveport, La.	52	32	13	4	2	1	2
Tulsa, Okla.	70	48	15	4	1	2	8
MOUNTAIN	714	475	134	41	31	33	51
Albuquerque, N. Mex.	94	65	15	7	4	3	8
Colo. Springs, Colo.	41	24	12	3	-	2	1
Denver, Colo.	116	78	23	3	6	6	8
Las Vegas, Nev.	106	70	25	5	3	3	8
Ogden, Utah	21	17	1	3	-	-	4
Phoenix, Ariz.	131	76	28	9	11	7	10
Pueblo, Colo.	24	19	3	1	-	1	2
Salt Lake City, Utah	42	25	7	4	-	6	1
Tucson, Ariz.	139	101	20	6	7	5	9
PACIFIC	2,066	1,357	392	193	64	51	130
Berkeley, Calif.	17	14	2	1	-	-	1
Fresno, Calif.	93	68	18	6	-	1	11
Glendale, Calif.	14	12	1	1	-	-	-
Honolulu, Hawaii	60	38	17	3	2	-	7
Long Beach, Calif.	86	63	15	4	1	3	12
Los Angeles Calif.	506	319	95	59	21	5	21
Oakland, Calif.	84	54	12	13	3	2	8
Pasadena, Calif.	61	45	7	5	1	3	8
Portland, Oreg.	154	108	29	10	2	5	11
Sacramento, Calif.	196	124	37	18	13	4	10
San Diego, Calif.	172	124	26	15	5	1	13
San Francisco, Calif.	156	94	26	22	4	9	4
San Jose, Calif.	188	115	48	13	9	3	12
Seattle, Wash.	176	115	37	13	1	10	3
Spokane, Wash.	56	37	10	4	2	3	5
Tacoma, Wash.	47	27	12	6	-	2	4
TOTAL	13,845††	9,167	2,809	1,091	369	392	852

*Mortality data in this table are voluntarily reported from 121 cities in the United states, most of which have populations of 100,000 or more. A death is reported by the place of its occurrence and by the week that the death certificate was filed. Fetal deaths are not included.

**Pneumonia and influenza.

†Because of changes in reporting methods in these 3 Pennsylvania cities, these numbers are partial counts for the current week. Complete counts will be available in 4 to 6 weeks.

††Total includes unknown ages.

§Data not available. Figures are estimates based on average of past 4 weeks.

Current Trends

Autopsy Frequency — United States, 1980-1985

In approximately 14% of the 2,089,378 deaths reported in the United States in 1985, an autopsy was performed. Recent reports indicate that the frequency of autopsy has been declining and that the decline may have adversely affected the accuracy of determining the underlying cause of death (*1*). To assess the recent variation in autopsy frequency, mortality data collected by the National Center for Health Statistics, CDC, for the period 1980-1985 were analyzed. During that time, the proportion of deaths involving an autopsy gradually declined from 17% to 14%. Within each year, however, autopsy frequency varied substantially by cause of death.

For this analysis, cause of death was grouped into six general categories: natural causes, unintentional injuries and poisonings,* suicide, homicide, external causes with undetermined intent, and unknown or unspecified causes. These groups correspond to the codes in the *International Classification of Diseases, Ninth Revision* (ICD-9) (Table 1).

The proportion of autopsies performed ranged from 12% among natural deaths to 97% among homicide deaths (Table 1). Deaths with unknown autopsy status were enumerated separately and excluded from the calculations. Although 12% of all records lacked autopsy data, the proportion of records without autopsy data varied from 2% among homicide deaths to 13% among natural deaths. In general, larger autopsy percentages are associated with smaller percentages of missing data.

Autopsies for natural deaths declined at least 0.5% every year during the period 1980-1985, from 13% in 1980 to 10% in 1985 (Figure 1). In contrast, the frequency of autopsies for deaths caused by unintentional injuries and poisoning increased from 46% to 51%, and the frequency among suicide deaths increased from 48% to 52%.

*This report uses the phrase "unintentional injury and poisoning" because there is no summary term in the ICD-9 manual to refer to codes E800-E949.

TABLE 1. Autopsy frequency, by cause of death — United States, 1980-1985

Cause of Death	ICD-9 Codes	No. of Deaths	Autopsy Status: Performed No.	Performed (%)†	Unknown* No.	Unknown* (%)
Natural	001-799.8	11,093,160	1,119,196	(12)	1,420,202	(13)
Unintentional Injury and Poisoning	E800-E949	582,669	264,796	(48)	32,113	(6)
Suicide	E950-E959	170,002	81,860	(50)	5,154	(3)
Homicide	E960-E979, E990-E999	130,745	123,941	(97)	2,266	(2)
Undetermined Intent§	E980-E989	19,468	15,325	(81)	602	(3)
Unknown or Unspecified	799.9	110,231	28,772	(30)	13,782	(13)
Total		**12,106,275**	**1,633,890**	**(15)**	**1,474,119**	**(12)**

*Death certificate does not indicate whether an autopsy was performed.
†Deaths with unknown autopsy status not included in denominator.
§Refers to external causes.

Autopsy Frequency — Continued

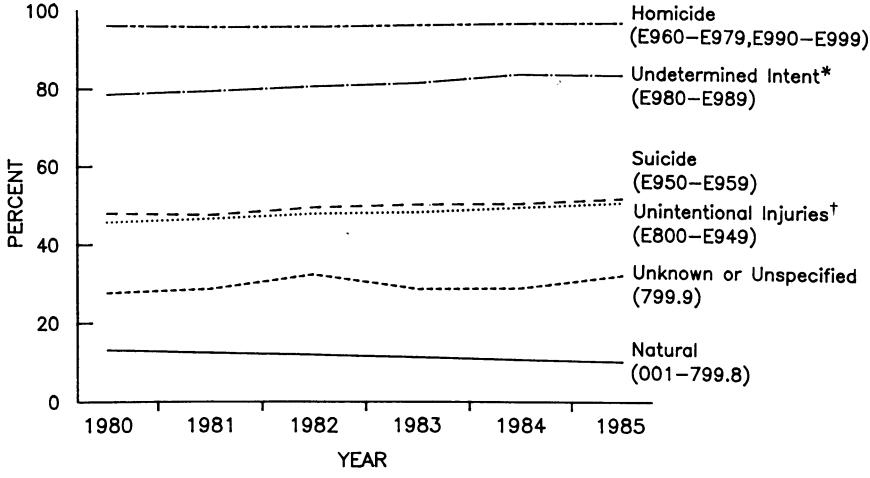
Similarly, autopsies among deaths due to external causes of undetermined intent increased from 79% to 84%. The frequency of autopsy among homicide deaths was consistently high over this period (between 96% and 97%). The number of autopsies for deaths of unknown or unspecified cause fluctuated between 28% and 32%.

The distribution of cause of death for all autopsies has changed. In 1980, natural deaths accounted for 70% of all autopsies. By 1985, natural deaths accounted for 66% of all autopsies.

Autopsies for natural deaths or deaths occurring among patients under the care of a physician are usually performed at the hospital where the death occurred and with the permission of the decedent's next of kin. If the death is sudden, unexpected, or due to external causes, local statutes may require an autopsy. This autopsy is either requested by a coroner or performed by a medical examiner, depending upon the local medicolegal system. Since deaths due to other than natural causes require medicolegal investigation in most states, the number of autopsies performed was examined by type of medicolegal jurisdiction in the state.

In 1980, 15 states had coroner systems; 18 states and the District of Columbia had medical examiner systems, and 17 states had both medical examiner systems and coroner systems (*2*). Approximately 44% of all deaths during the period 1980-1985 occurred in states with both medical examiners and coroners (a mixed medicolegal system); 29% of deaths occurred in states with a medical examiner system; the remaining 27% occurred in states with a coroner system. The percentage of deaths in which an autopsy was performed during this 6-year period was greatest among states with a mixed medicolegal system, 16% (Table 2). States with a medical examiner system had autopsies performed in 15% of deaths and states with coroners, 14%. States with a coroner system had the highest proportion of death records that did not indicate whether an autopsy was performed (16%), and states with mixed systems had the smallest (10%).

FIGURE 1. Percentage of deaths involving autopsy, by cause of death — United States, 1980-1985



*Refers to external causes.
†Includes unintentional poisonings.

Autopsy Frequency — Continued

When autopsy frequency was examined by medicolegal system and cause of death, states with a medical examiner system had the highest autopsy frequency for deaths due to unintentional injuries and poisoning , homicide, suicide, undetermined intent, and unknown causes (Figure 2). States with mixed systems had higher autopsy frequencies for deaths due to unintentional injuries and poisoning, suicide, and undetermined intent than did states with coroners. The same pattern of annual trends was observed for each medicolegal system (Figure 1).

Reported by: Surveillance and Programs Br, Div of Environmental Hazards and Health Effects, Center for Environmental Health and Injury Control.

Editorial Note: Death certificates are the principal source of mortality statistics for the United States. Several studies, however, have raised questions concerning the accuracy of the recorded cause of death (*3,4*), and some investigators have advocated improving these statistics by performing more autopsies. Current data show a decline in the proportion of autopsy for natural causes of death (*1*) and an increase in autopsy proportions for medicolegal deaths (homicides, suicides, and deaths caused by unintentional injuries and poisoning). As a result, 34% of autopsies performed in 1985 involved deaths due to other than natural causes, compared to 30% of autopsies performed in 1980.

State and local laws vary, but medical examiners and coroners typically have the legal authority to order autopsies for traumatic, sudden, or unexpected deaths. A more accurate picture of the frequency of autopsy among deaths outside of the medicolegal system would require separating the sudden or unexpected deaths from other natural deaths. Such an analysis might reveal even lower autopsy frequency for natural deaths occurring in health-care facilities.

Death certificates that fail to indicate whether an autopsy was performed represent another potential source of bias. Larger autopsy percentages were associated with more complete data (Table 1). If deaths with missing data involved autopsy less

TABLE 2. Percentage of deaths involving autopsy, by medicolegal death investigation systems — United States, 1980-1985

Medicolegal System	States*	No. of Deaths	Autopsy Status			
			Performed		Unknown†	
			No.	(%)§	No.	(%)
Medical Examiner Only	AZ,CT,DE,DC,FL,IA,ME, MD,MA,MI,NH,NJ,NM,OK, OR,RI,UT,VT,VA	3,484,673	460,148	(15)	390,647	(11)
Medical Examiner and Coroner	AK,AR,CA,GA,HI,KY,MN, MS,MO,MT,NY,NC,SC,TN, TX,WV,WI	5,284,512	772,125	(16)	536,405	(10)
Coroner Only	AL,CO,ID,IL,IN,KS,LA, NE,NV,ND,OH,PA,SD,WA, WY	3,337,090	401,617	(14)	547,067	(16)

*Includes District of Columbia.
†Death certificate does not indicate whether an autopsy was performed.
§Deaths with unknown autopsy status not included in denominator.

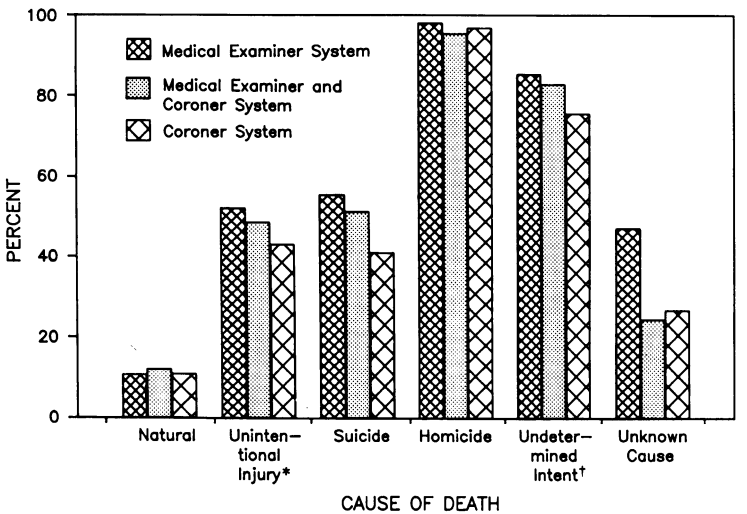
Autopsy Frequency — Continued

frequently than deaths with complete data, the overall proportion of deaths with autopsy would be lower than the results reported here. This bias would have the greatest effect on natural deaths because that group had the highest proportion of missing data.

States with mixed medicolegal systems have some counties with coroners and others with medical examiners. Jurisdictions with medical examiners are often densely populated urban counties, whereas jurisdictions with coroners are often less populated rural counties. To determine if the higher autopsy frequencies are related to the urban settings or to the presence of medical examiners, each medicolegal jurisdiction and the accompanying population characteristics must be identified.

Finally, the quality and detail of the autopsy protocols—some are only partial and may not include toxicological testing—should be considered when assessing whether autopsy alone is indicative of a more accurate determination of the cause of death.

FIGURE 2. Percentage of deaths involving autopsy in states with medical examiners or coroner jurisdictions, by cause of death, United States, 1980-1985



*Includes unintentional poisonings.
†Refers to external causes.

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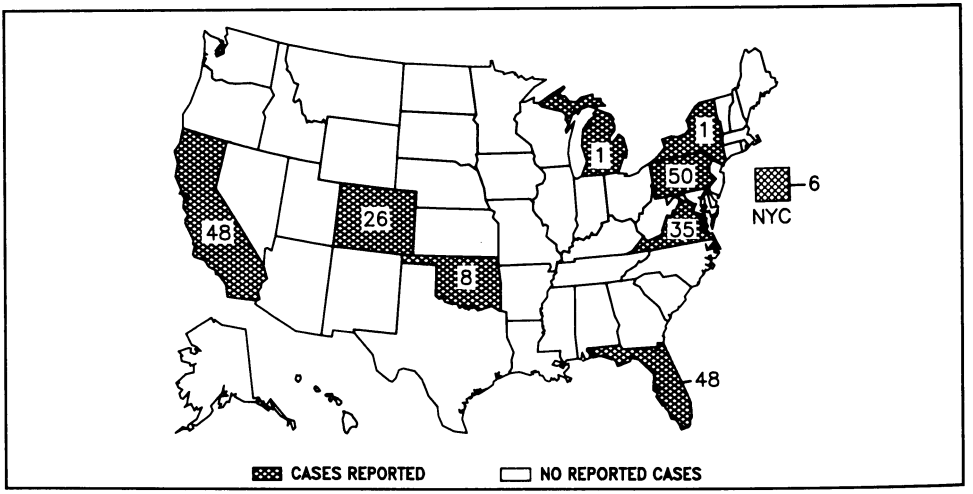
Notice to Readers

Short Course in Field Epidemiology and Biostatistics

The second annual Short Course in Field Epidemiology and Biostatistics for physicians will be held in Thailand from June 6 through July 29, 1988. The course is sponsored by the Thailand Field Epidemiology Training Program (FETP). The first 4 weeks will include classroom lectures on basic epidemiological and statistical skills and practical exercises in disease surveillance, epidemic investigation and control, and applied field research. The last 4 weeks will consist of supervised field work in disease surveillance.

The course will be conducted in English. Registration should be made by April 30. For information, contact Dr. Khanchit Limpakarnjanarat, FETP, Division of Epidemiology, Ministry of Public Health, Bangkok 10200 Thailand (telephone: 66+2+281-1479; cable: MINHELTH BK 10200; Dialcom: 132:PHF49808; U.S. telex: 4909945409 PHN UI).

FIGURE I. Reported measles cases — United States, Weeks 8-11, 1988



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The data in this report are provisional, based on weekly reports to CDC by state health departments. The reporting week concludes at close of business on Friday; compiled data on a national basis are officially released to the public on the succeeding Friday. The editor welcomes accounts of interesting cases, outbreaks, environmental hazards, or other public health problems of current interest to health officials. Such reports and any other matters pertaining to editorial or other textual considerations should be addressed to: Editor, *Morbidity and Mortality Weekly Report*, Centers for Disease Control, Atlanta, Georgia 30333.

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